Alaska Energy Statistics

1960-2010
Final Report

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in collaboration with

Alaska Energy Authority

June 2012

Acknowledgments

We sincerely appreciate the time and effort of numerous electric utilities, AEA program managers and staff, and many other colleagues who shared information, reviewed this report and provided valuable feedback.

Suggested citation:

Fay, Ginny, Alejandra Villalobos Meléndez, and Amber Converse, 2011, *Alaska Energy Statistics 1960-2010*, prepared for Alaska Energy Authority, June 2012, 32 pages.

TABLE OF CONTENTS

INTRODUCTION

Prior to 1985, the federal Alaska Power Administration published the *Alaska Electric Power Statistics*. Then, the Alaska Energy Authority (formerly the Alaska Power Authority) began gathering statistical data and publishing this annual report. In 1988, the *Alaska Electric Power Statistics* report became a combined effort between the Alaska Systems Coordinating Council and the Alaska Energy Authority. Beginning in 1993, the report became a joint effort between the Alaska Systems Coordinating Council and the Alaska Department of Community and Regional Affairs, Division of Energy. After the 1995 report, no further reports were published until 2003 when a report was prepared by the Institute of Social and Economic Research (ISER), University of Alaska Anchorage (UAA), with funding provided by the Alaska Energy Authority (AEA), the Regulatory Commission of Alaska (RCA), and the Denali Commission.

This report of the twenty-fifth edition of the *Alaska Electric Energy Statistics* was prepared by the Institute of Social and Economic Research in collaboration with the Alaska Energy Authority. Continuing the new 2009 format, data tables are presented solely in digital form in a MS Excel file that contains all data tables. The workbook containing the data tables are available on the ISER website at http://iser.uaa.alaska.edu/Publications/2012_06-AlaskaEnergyStatisticsCY2010Tables.xlsx) and the AEA website (http://www.akenergyauthority.org/).The data tables are presented in a dataset format for convenient use and manipulation. All data presented is identified by the geographic regions used historically in previous Alaska Electric Energy Statistics[1] as well as AEA energy regions, Native corporation regions and census areas. The data tables available in the workbook are as follows:

Table	Description
Summary Tables	***By AEA Energy Regions***
Table 1.a	Utilities Participating in the Power Cost Equalization program
Table 1.b	Installed Capacity (kW)
Table 1.c	Net Generation (MWh)
Table 1.d	Net Generation by Fuel Type (MWh)
Table 1.e	Fuel Use for Power Generation (Physical Units, MMBtu)
Table 1.f	Sales (MWh)
Table 1.g	Revenue ($000)
Table 1.h	Customers (Accounts)
Detailed Tables	
	Installed Capacity
Table 2.1a	Installed Capacity by Prime Mover by Plant
Table 2.1b	Installed Capacity by Prime Mover (Percent Distribution)
	Net Generation and Disposition
Table 2.2a	Net Generation and Total Disposition (MWH)
Table 2.3a	Net Generation by Prime Mover
Table 2.3b	Net Generation by Fuel Type and Fuel Use
Table 2.3c	Net Generation, Fuel Use, and Fuel Cost by Plant

[1] The regions are: Arctic Northwest, South Central, South East, South West and Yukon.

Table 2.4a	Utility CO2 Emissions
	Revenue, Customers and Prices
Table 2.5a	Utility Sales, Revenue, and Customers
Table 2.5b	Average Annual Energy Use and Rates
Table 2.5c	Residential Rates and PCE payments
	Electric Utility Historical Tables
Table 3.1	Utility Installed Capacity by Prime Mover
Table 3.2	Utility Installed Capacity by Region
Table 3.3	Utility Net Generation by Fuel
Table 3.4	Utility Net Generation by Region
Table 3.5	Utility Sales, Revenue, and Customers
Table 3.6	Average Annual Energy Use and Rates

This accompanying text is meant to provide a brief introduction, highlights and summary tables only. The summary tables presented in this report use the AEA *Energy Pathway* publication regions. Maps illustrating these regions are in Appendix B. We also include a glossary of terms.

The twenty-third edition (2008 tables) published in May 2011 included tables reporting military and industrial generation data. However, due to lack of data availability this report does not contain that information. Information on utility electricity capacity, generation, and other characteristics was gathered from reports filed with the U.S. Department of Energy (DOE), Energy Information Administration (EIA). Though data from these survey forms was not yet available on the EIA website when the preliminary report was being prepared, the Alaska Energy Authority directly collected copies of the EIA survey forms 860, 861 and 923 from a select number of utilities. After EIA data files were finalized, a careful cross-check between preliminary data gathered by AEA and these final published data files were conducted. Additionally, we used data collected by the Alaska Energy Authority through the Power Cost Equalization (PCE) program and a limited number of direct contacts with electric power producers. This change in methodology allowed us to produce a preliminary report in September 2011 which has now been completed after data files were published by EIA. This final report contains the best available public information regarding electric utilities in Alaska.

All producers of electricity with installed capacity greater than one megawatt are required by law to report their operations to the federal government. A number of utilities in Alaska fall below that installed capacity threshold. Information for these smaller utilities came primarily from the PCE program. The installed capacity table (Table 2.1a) includes all utilities for which data are available.

In many parts of the state there is no utility-produced electricity available and any activity requires that electricity must self-generate. The number of such small installations (e.g. Point Baker, Port Protection, Telida) is quite large and it would be a very expensive task to try to identify and contact each one individually.

It is important to note, that this publication is meant to serve as general reference and broad overview of electric power in Alaska. Because data comes from a variety of sources and imperfections in the source data, the reader may find inconsistencies across different tables. For example, Table 2.5b shows average rate per kilowatt-hour as calculated using the reported revenue, sales and customers; while Table 2.5c shows average rate per kilowatt hour as reported by the utility to the PCE program; these two

rates are sometimes slightly different[2]. Data in different tables may include different cases, or may be guided by slightly different concept definitions depending on the data source. However, the authors of this report believe that the data presented provide a reasonable and valuable overview of electric power and energy across Alaska.

SUMMARY AND HIGHLIGHTS

The purpose of this report is to present electric power reference data for Alaska; it is not intended to provide detailed analysis of energy production, consumption or uses. Nevertheless, this section highlights information that may be of particular interest to the reader.

Scope of Report

The Alaska Energy Authority and the Institute of Social and Economic Research at the University of Alaska Anchorage prepared this report, which primarily presents 2010 data on electricity produced by utilities in Alaska, including summary and detailed tables showing:

- Installed capacity by:
  - type of utility,
  - prime mover
  - and plant
- Fuel
  - use
  - cost
  - CO_2 emissions
- Net generation:
  - type of utility
  - prime mover
  - and fuel type
- Utility
  - sales
  - revenue
  - customers
    - average annual electricity use
    - average annual electricity price

Electricity Generation and Cost

- In 2010, Alaska had about 2,202 megawatts of utility installed capacity that generated about 6.5 million megawatt-hours of electricity.
- In 2010, the statewide portion of electricity generated by natural gas increased from 55% to 57%; the portion of hydroelectric power increased from 20% in 2009 to 22% in 2010[3]; generation from oil products decreased from 18% to 15%; while coal decreased from 7%to 6%.Generation from wind remained less than 1%; but it increased from about 0.14% in 2009 to 0.31% statewide. The statewide picture varies sharply by region.
- The Railbelt region is home to most of the state's population which uses most (about 78%) of the electricity. Natural gas is used to generate most of the electricity for the Railbelt, but the region also has hydroelectric capacity.
- Many (but not all) communities in Southeast Alaska generate electricity with hydroelectric capacity; some rely on diesel. Most use diesel for back-up generation.

[2] Only for PCE communities. Communities for which the data source is EIA report the same calculated rate as in Table 2.5b.

[3] The amount of electricity produce from hydroelectric resources varies from year to year depending on water levels. Over the last decade, hydro power does not show a significant positive trend.

- Rural communities in western and interior Alaska rely primarily on diesel to generate electricity, but wind power is being added in a growing number of rural locations, financed largely by the Alaska Renewable Energy Fund. Since 2008, the annual amount of electricity generated by wind increased over nine fold to 20,348 MWh.
- Wood was used to generate heat in community-level thermal facilities in about ten communities, mostly in Southeast where wood resources are abundant.
- The average annual residential use of electricity statewide in 2010 was about 7,670 kilowatt-hours—but that ranged from around 1,100 kilowatt-hours in places where electricity is most expensive to more than 13,800 where it is cheapest. The national average annual use is about 11,000 kilowatt-hours.

Communities in Southeast Alaska that rely primarily on hydroelectric power to generate electricity had the lowest rates (as little as 10 cents per kilowatt-hour in 2010).[4] Residents of Anchorage and other places in Southcentral Alaska that rely mostly on natural gas for generation paid around 13 cents per kilowatt hour in 2010. Alaskans in small remote rural places that rely on diesel had the most expensive electricity (from roughly 50 cents to more than $1.50 per kilowatt hour in 2010). The state helps to lower the price of electricity in most of those remote rural communities through the Power Cost Equalization program, but electric bills still remain much higher in remote rural areas than in urban communities.

Electric Utilities Summary Tables

Table 1.a Utilities[5]/Communities Participating in Power Cost Equalization Program, 2010 By AEA Energy Regions

AEA Energy Region	Active	Inactive	Ineligible	Total	Percent Active
Aleutians	12	1	0	13	92%
Bering Straits	17	0	0	17	100%
Bristol Bay	25	1	0	26	96%
Copper River/Chugach	6	0	2	8	75%
Kodiak	4	1	1	6	67%
Lower Yukon-Kuskokwim	48	0	0	48	100%
North Slope	7	1	0	8	88%
Northwest Arctic	12	1	0	13	92%
Railbelt	0	0	14	14	0%
Southeast	21		10	31	68%
Yukon-Koyukuk/Upper Tanana	38	3	2	43	88%
State Total	**190**	**8**	**29**	**227**	**84%**

[4] The construction of many of these facilities was paid for with public funds which accounts in part for the lower rates.

[5] *Note: For utilities that serve many communities with no grid such as AVEC and AP&T, each community is counted as a separate utility.*

Figure 1. PCE Eligible Communities

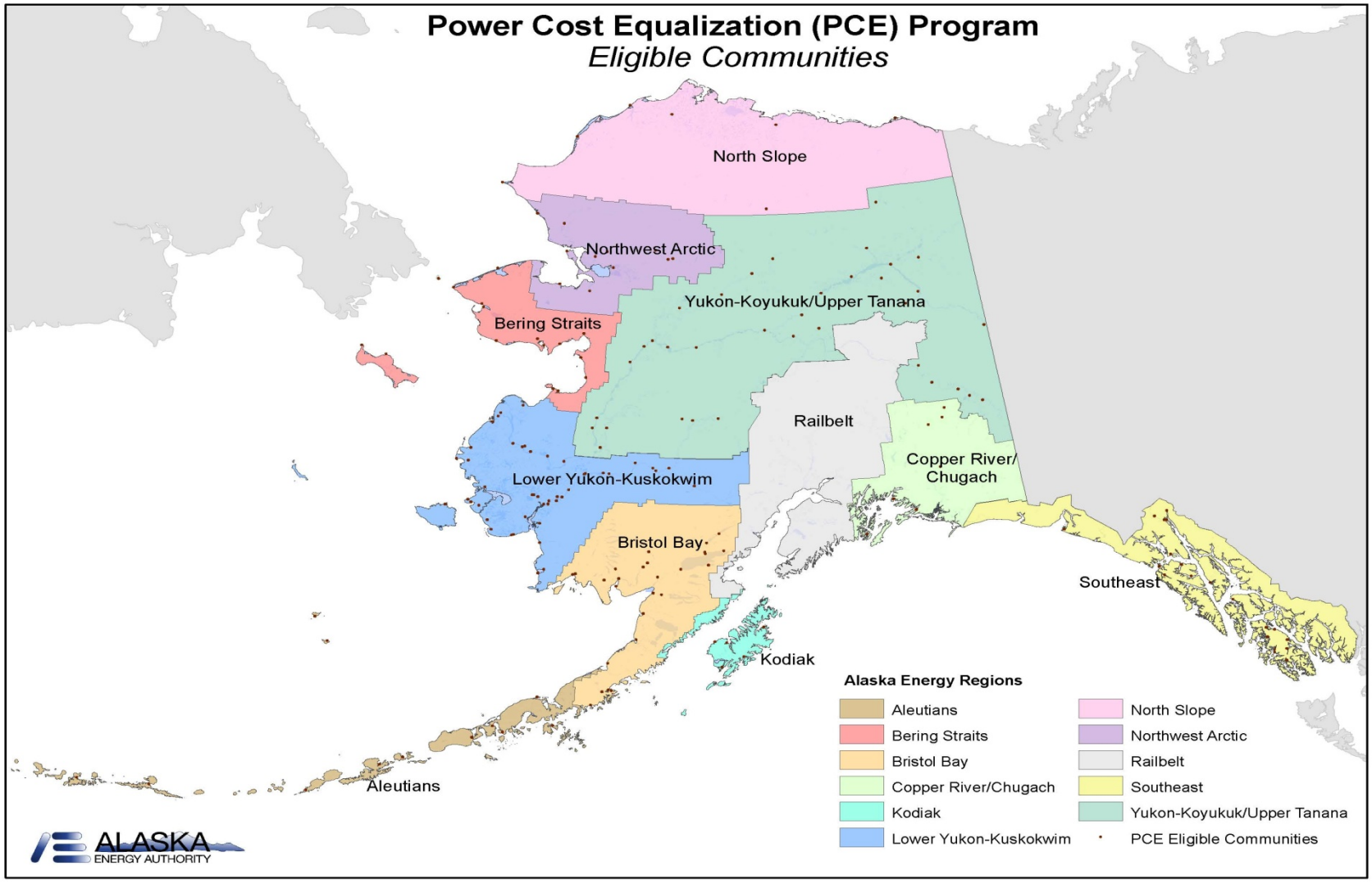


Table 1.b Installed Capacity (kW), 2010
By AEA Energy Regions

AEA Energy Region	Total	Percent of Total
Aleutians	34,945	2%
Bering Straits	38,709	2%
Bristol Bay	27,561	1%
Copper River/Chugach	56,255	3%
Kodiak	63,056	3%
Lower Yukon-Kuskokwim	51,102	2%
North Slope	40,600	2%
Northwest Arctic	32,042	1%
Railbelt	1,418,213	64%
Southeast	410,733	19%
Yukon-Koyukuk/Upper Tanana	29,184	1%
State Total	**2,202,400**	**100%**

Compared to 2009 the installed capacity remained stable without significant growth. The exception was wind installed capacity which almost doubled from 7,884kW in 2009 to 11,707 kW in 2010. Since 2008, wind installed capacity increased more than four fold. However, wind accounts for less than half of one percent of the total installed capacity in Alaska.

- Railbelt hydroelectric installed capacity is 13% of the Railbelt total
- Hydroelectric installed capacity is 20% of the statewide total
- Railbelt total installed capacity is 64% of the statewide total

Railbelt Hydroelectric: 190MW
Railbelt Total: 1,418 MW

Alaska Hydroelectric: 442 MW
Alaska Total: 2,202 MW

Table 1.c Net Generation (MWh), 2010
By AEA Energy Regions

AEA Energy Region	Total	Percent of Total
Aleutians	51,565	1%
Bering Straits	46,043	1%
Bristol Bay	45,428	1%
Copper River/Chugach	113,912	2%
Kodiak	148,013	2%
Lower Yukon-Kuskokwim	101,289	2%
North Slope	83,140	1%
Northwest Arctic	44,674	1%
Railbelt	5,031,183	78%
Southeast	789,060	12%
Yukon-Koyukuk/Upper Tanana	31,187	0%
State Total	**6,485,494**	**100%**

Compared to 2009, in 2010 net generation increased just over 1% point; except power generated by wind which more than doubled from 9,152 MWh in 2009 to 20,348 MWh in 2010. However, wind accounts for less than half of one percent of the total power generation in Alaska.

- Railbelt hydroelectric generation remained stable at 9% of the Railbelt total.
- Hydroelectric generation was 22% of the statewide total, increasing from 20% in 2009.
- Railbelt total generation was 78% of the statewide total, decreasing from 79% in 2009.

Railbelt Hydroelectric: 467,864 MWh
Railbelt Total: 5,031,183 MWh

Alaska Hydroelectric: 1,428,838 MWh
Alaska Total: 6,484,493 MWh

Table 1.d Net Generation by Fuel Type (MWh), 2010
By AEA Energy Regions

AEA Energy Region	Oil	Gas	Coal	Hydro	Wind	Total
Aleutians	49,236			2,328		51,564
Bering Straits	43,814				2,229	46,042
Bristol Bay	45,414			3	11	45,428
Copper River/Chugach	51,413			62,498		113,911
Kodiak	11,242			124,165	12,606	148,013
Lower Yukon-Kuskokwim	98,780				2,509	101,289
North Slope	28,460	54,680				83,140
Northwest Arctic	40,577			3,005	1,092	44,674
Railbelt	532,208	3,635,555	393,673	467,864	1,901	5,031,201
Southeast	20,086			768,974		789,060
Yukon-Koyukuk/ Upper Tanana	31,187					31,187
Total	**952,417**	**3,690,235**	**393,673**	**1,428,837**	**20,348**	**6,485,510**
	15%	**57%**	**6%**	**22.0%**	**0.31%**	**100%**

Figure 2. Alaska Utilities Net Generation by Fuel Type, 2010

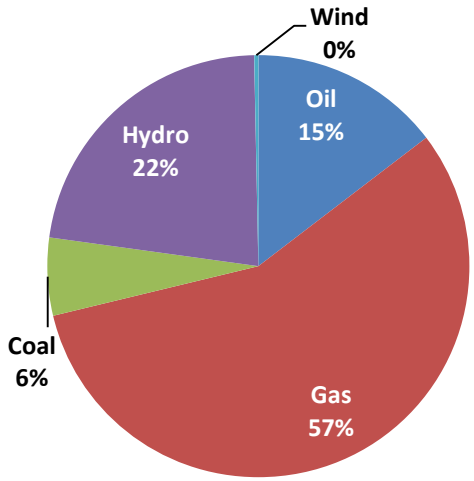


Table 1.e Fuel Use for Power Generation, 2010
By AEA Energy Regions

AEA Energy Region	Oil (Barrels)	Gas (Mcf)	Coal (Short Tons)
Aleutians	90,412		
Bering Straits	69,846		
Bristol Bay	87,683		
Copper River/Chugach	117,887		
Kodiak	20,812		
Lower Yukon-Kuskokwim	180,810		
North Slope	51,226	755,159	
Northwest Arctic	58,761		
Railbelt	889,067	38,976,546	409,828
Southeast	41,195		
Yukon-Koyukuk/Upper Tanana	56,991		
Total (Physical Units)	**1,664,691**	**39,731,705**	**409,828**
Conversion Factor[6](MMBtu)	5.825	1.025	19.536
Total MMBtu	**9,696,822**	**40,724,998**	**8,006,400**

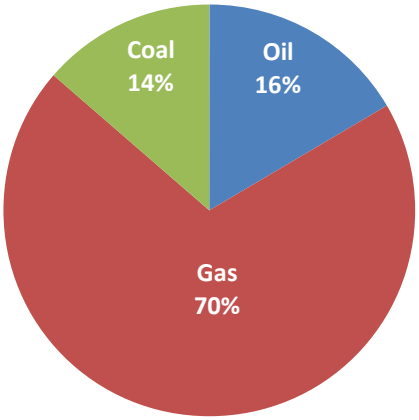
The fossil fuel most used for electricity generation in Alaska is natural gas, though it is only available in the Railbelt and some communities in the North Slope region. Natural gas accounts for 70% of fossil fuels consumed by utilities for power generation, about a 4% points increase from 2009. It appears that the increase in natural gas displaced diesel fuel, the second most used fossil fuel for power generation, which decreased 4% points to about 16% of fuel used in 2010. The Railbelt region consumes the most diesel for power generation in Alaska (mostly for stand-by). Compared to 2009, Railbelt consumption of diesel fuel decreased about 6% points to 53% of the 2010 statewide fuel used by Alaska utilities. The Lower Yukon-Kuskokwim region had a 3% point increase in diesel fuel use raising its state's share to 11% of diesel fuel used. Finally, coal makes up 14% of the fossil fuels used and had no change from 2009. Coal is only used in the Railbelt regions, specifically in the Fairbanks area, which has a convenient local supply.

In 2010, burning of fossil fuels to generate power produced about 3.6 million metric tons of carbon dioxide, a 3% decrease. This decrease most likely resulted from the substitution of

[6] Thermal conversion factors can be used to estimate the heat content in British thermal units (BTU) of a given amount of energy measured in physical units. The conversion factors shown correspond the average amount of BTUs found in barrels of oil Mcf of natural gas and short tons of coal respectively, as published by the U.S. Energy Information Administration.

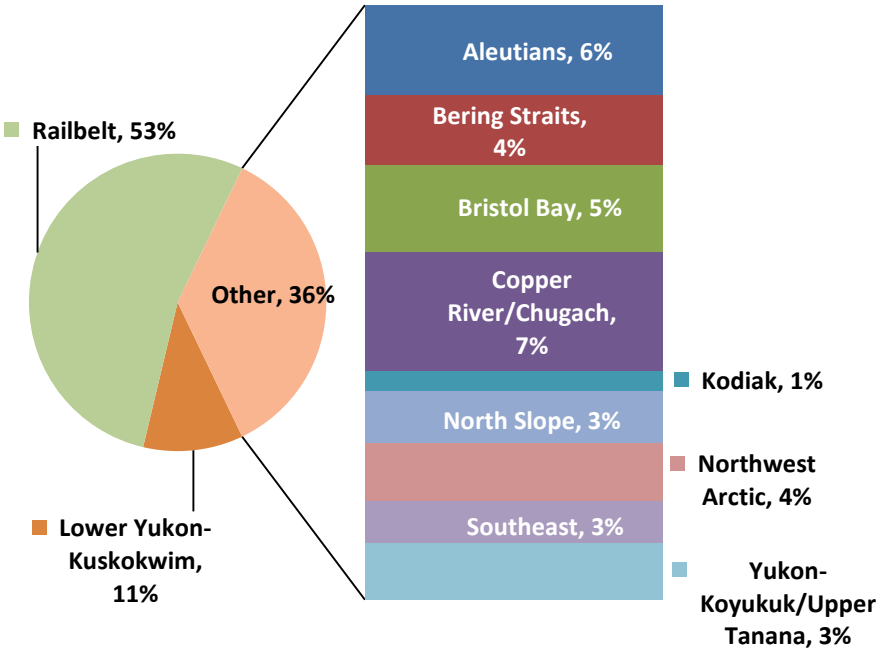
natural gas for diesel, as natural gas burns more cleanly[7]. About 60% of utility CO_2 emissions were produced from burning natural gas, 21% from coal and 19% from diesel.

Figure 3. Distribution of Fuel Used by Utilities for Power Generation in Alaska



**Distribution based on MMBtu energy equivalent units.*

Figure 4. Barrels of Oil Used for Electricity Generation by Utilities, by Energy Regions



[7] The amount carbon dioxide emissions associated with fuel consumption by stationary sources, such as a utility, are lower when consuming natural gas (53.06 Kg CO_2 /MMBtu, weighted national average) than when consuming petroleum distillate fuels (73.15 Kg CO_2/MMBtu). To find additional information please refer to the U.S. Energy Information Administration website at http://www.eia.gov/oiaf/1605/emission_factors.html.

Table 1.f Sales (MWh), 2010
By AEA Energy Regions

AEA Energy Region	Residential	Commercial	Other[8]	Total	Percent of Total
Aleutians	8,752	34,008	10,065	52,826	1%
Bering Straits	14,124	16,924	10,519	41,567	1%
Bristol Bay	14,923	25,751	11,193	51,868	1%
Copper River/Chugach	23,747	72,149	4,721	100,617	2%
Kodiak	34,586	21,828	84,901	141,315	2%
Lower Yukon-Kuskokwim	31,302	35,914	21,725	88,942	1%
North Slope	17,199	58,556	1,465	77,221	1%
Northwest Arctic	12,699	12,017	8,138	32,853	1%
Railbelt	1,619,410	2,126,687	1,036,081	4,782,178	77%
Southeast	308,371	310,686	176,606	795,663	13%
Yukon-Koyukuk/Upper Tanana	11,334	8,087	8,445	27,866	0%
Total	**2,096,447**	**2,722,607**	**1,373,861**	**6,192,915**	
Percent of Total	**34%**	**44%**	**22%**		

Electricity sales show a decrease of about 1.5% compared to 2009. Some regions appear to have significant drops in reported sales. For example, North Slope shows a 37% decrease, Bering Straits about 21%, Yukon-Koyukuk/Upper Tanana region about 15%. However, these differences result from unavailable data or utilities with only partial reporting.[9] So, it's likely that statewide generation levels remain stable.

As expected most of the power sales were in the Railbelt region. The Southeast and Railbelt regions had the highest annual average use per residential customer of about 9,620 kWh and 7,670 kWh, respectively. The Yukon-Koyukuk/Upper Tanana and Bering Straits regions had the lowest annual average use per residential customer of about 3,822 kWh and 4,200 kWh, respectively.

Overall, slightly less than half, about 44%, of the electricity produced in Alaska was sold to commercial customers. The North Slope and Railbelt regions had the highest annual average use per commercial customer of about 72,040 kWh and 71,470 kWh, respectively. The Yukon-Koyukuk/Upper Tanana and Kodiak regions have the lowest annual average use per commercial customer of about 13,110 kWh and 20,120 kWh, respectively.

[8] The significant differences between 2009 are 2010 figures are methodological. In 2010, industrial sales are included in the 'Other' category. In 2009, industrial customers were included in the commercial category and 'Other' included sales to community, governmental facilities and others.

[9] For example: For the North Slope region, data for commercial sales from Deadhorse (TDX) is not available; for the Bering Straits region only partial reporting is available for Nome Utilities (missing 4 months of data); for the Yukon-Koyukuk/Upper Tanana region, data for Galena was not reported.

Table 1.g Revenue ($000), 2010
By AEA Energy Regions

AEA Energy Region	Residential	Commercial	Other	Total	Percent of Total
Aleutians	3,816	13,924	4,726	22,466	2%
Bering Straits	6,258	6,751	4,727	17,736	2%
Bristol Bay	6,543	11,310	5,011	22,865	2%
Copper River/Chugach	6,730	17,292	1,747	25,769	3%
Kodiak	6,368	3,932	13,782	24,081	3%
Lower Yukon-Kuskokwim	16,222	17,276	11,354	44,852	5%
North Slope	2,213	6,857	221	9,291	1%
Northwest Arctic	6,523	5,661	4,594	16,778	2%
Railbelt	244,732	244,451	147,352	636,535	69%
Southeast	37,064	35,742	18,506	91,312	10%
Yukon-Koyukuk/Upper Tanana	5,913	4,344	4,607	14,864	2%
Total	**342,382**	**367,541**	**216,627**	**926,549**	
Percent of Total	**37%**	**40%**	**23%**	**100%**	

Compared to 2009, 2010 revenues from electricity sales show a decrease about 4%. This is a reflection of the decrease in the kWh sales. Distribution of revenues across energy regions remained without significant change. The Northwest Arctic region had the highest average revenue per residential customer per year of about $3,435, a 10% decrease from 2009; followed by the Lower Yukon Kuskokwim region which averaged about $2,570, a 10% decrease from 2009. The North Slope region had the lowest average revenue per residential customer per year of about $1,020, a 4% decrease from 2009; followed by the Southeast region which averaged about $1,160, a 2% decrease from 2009. Overall 40% of the revenues from electricity sales came from the commercial sector because of their higher use (44% of sales, Table 1f).

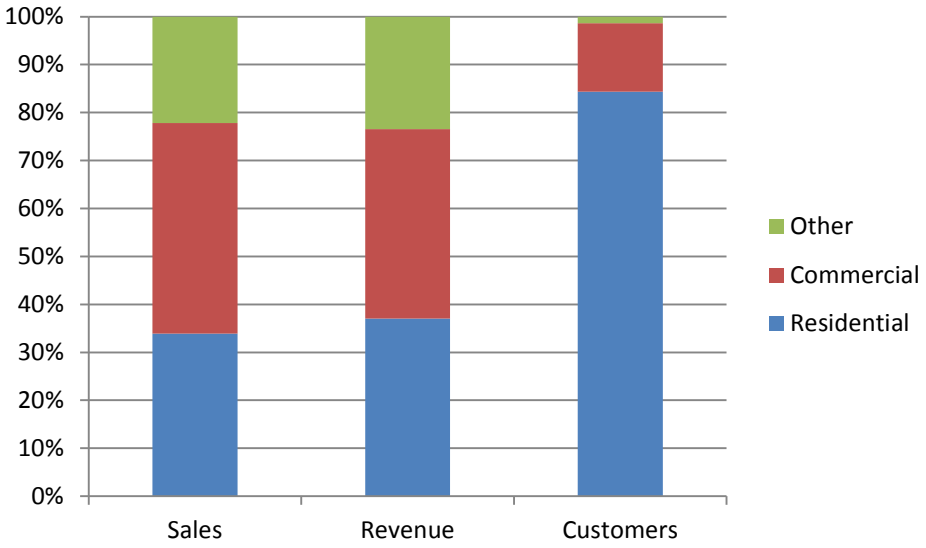
Table 1.h Customers (Accounts), 2010
By AEA Energy Regions

AEA Energy Region	Residential	Commercial	Other	Total	Percent of Total
Aleutians	1,531	710	353	2,594	1%
Bering Straits	3,363	511	401	4,275	1%
Bristol Bay	3,008	1,006	505	4,519	1%
Copper River/Chugach	4,010	1,495	155	5,660	2%
Kodiak	4,895	1,085	139	6,118	2%
Lower Yukon-Kuskokwim	6,309	1,663	743	8,715	3%
North Slope	2,172	813	40	3,025	1%
Northwest Arctic	1,900	218	243	2,361	1%
Railbelt	211,108	29,758	615	241,481	75%
Southeast	32,057	8,273	784	41,114	13%
Yukon-Koyukuk/Upper Tanana	2,965	617	469	4,051	1%
Total	**273,317**	**46,150**	**4,448**	**323,915**	
Percent of Total	**84%**	**14%**	**1%**	**100%**	

As expected, the regions with the most customer accounts were the Railbelt and Southeast. All other regions, only account for 13% of total power customers. There were no significant changes in the number of customer accounts or regional distribution between 2009 and 2010. Residential accounts made up most of the power customers in Alaska, about 84%. Figure 5 shows in detail the distribution of utility sales, revenue and customers by customer type.[10]

[10] The significant differences between 2009 are 2010 figures are methodological. In 2010, industrial sales are included in the 'Other' category. In 2009, industrial customers were included in the commercial category and 'Other' included sales to community, governmental facilities and others.

Figure 5. Distribution of Utility Sales, Revenue and Customers by Customer Type



Utility Installed Capacity and Net Generation over time

Installed Capacity

In Alaska, utility installed capacity for power generation increased steadily between 1970s to the late 1990s, peaking in 2001 at 2,259 MW. From 2002 to 2005 there was a steady decline to about 1,890 MW. Since 2006, Alaska saw installed capacity growth, almost reaching 2001 levels in 2010 with 2,189 MW.

The prime mover type with the largest share of installed capacity is combustion gas turbines, which comprised about 36%. Hydroelectric turbines, internal combustion generators and combined cycle gas turbines had equal shares of 20% each. Finally, steam and wind turbines were the least common prime movers in Alaska with shares of 3% and 0.53%, respectively.

Net Generation

Since records have been available, net generation in Alaska steadily increased at an average rate of 5% per year, except in 1998 when there was a significant drop of about 10%. Natural gas is the most prevalent fuel used for power generation, 57% in 2010. Generation from hydro power is the second most prevalent source of power and increased at about 5% per year. The shares of net generation from petroleum products and coal remained stable over time, 15% and 6%, respectively, in 2010. Since 2008, wind generation increased, though it does not currently represent a significant share of statewide generation.

Figure 6. Installed Capacity by Prime Mover over Time

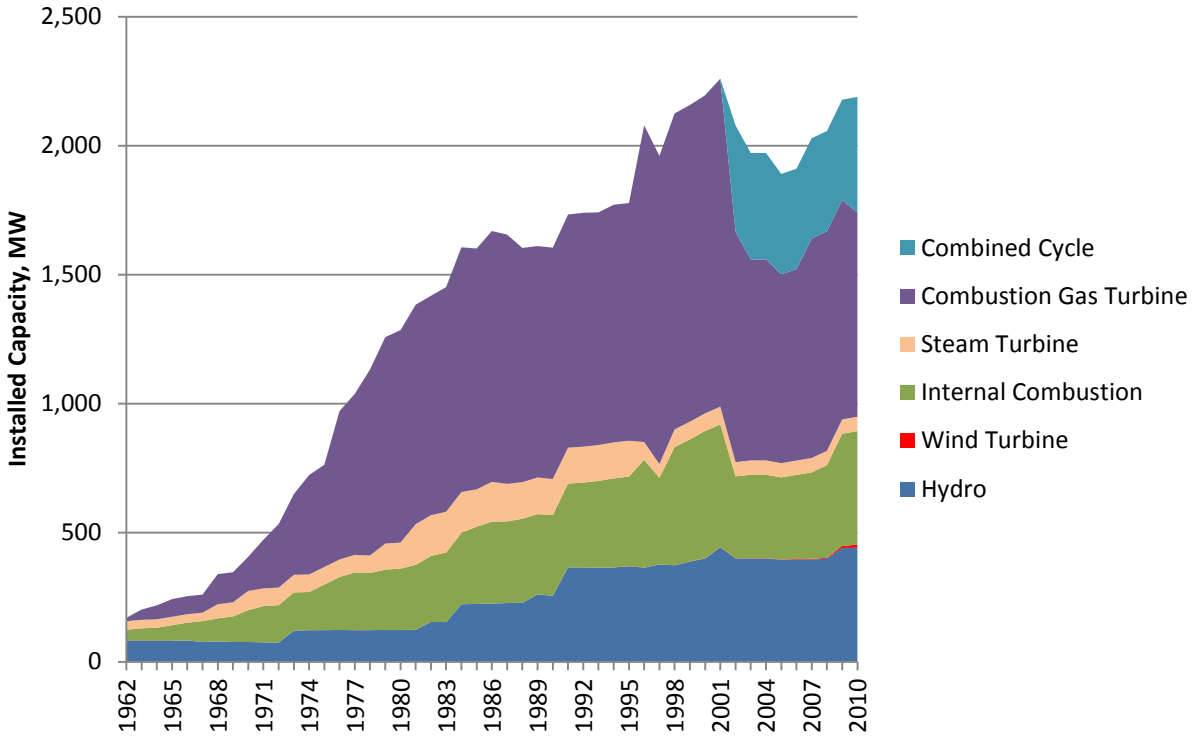
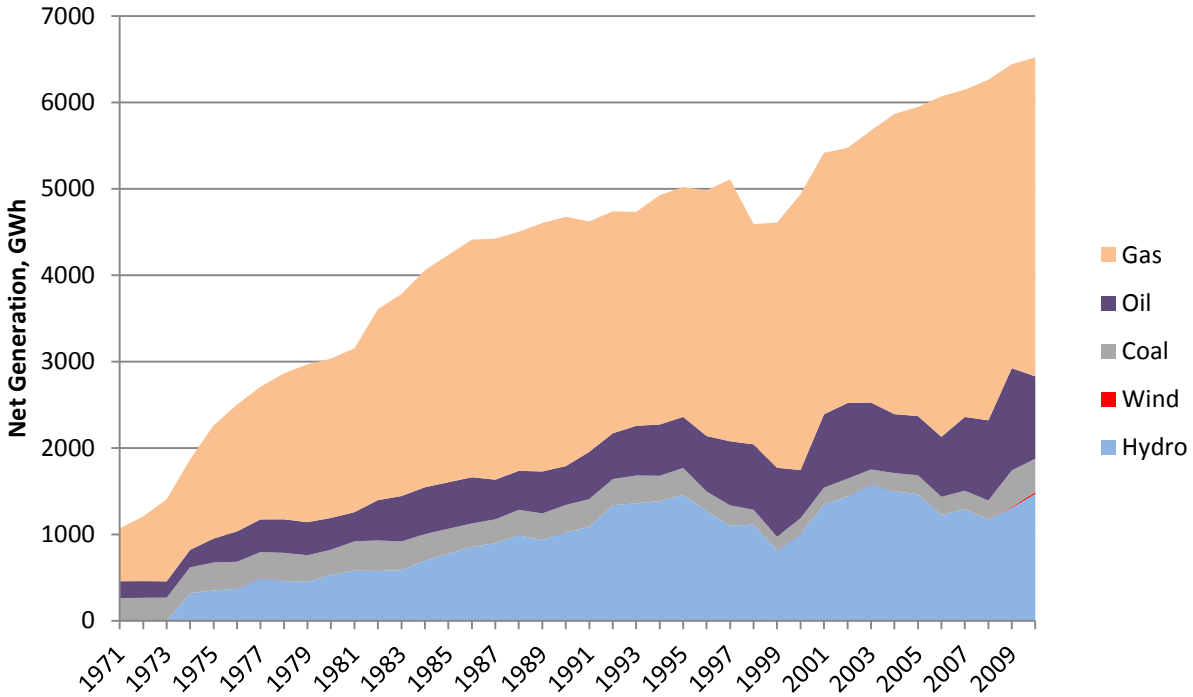


Figure 7. Net Generation by Fuel Type over Time



Appendix A. Glossary of Terms[11]

Alaska Energy Authority (AEA): A public corporation of the state with a separate and independent legal existence with the mission to construct, finance, and operate power projects and facilities that utilize Alaska's natural resources to produce electricity and heat. http://www.akenergyauthority.org/

Auxiliary Generator: A generator at the electric plant site that provides power for the operation of the electrical generating equipment itself, including related demands such as plant lighting, during periods when the electric plant is not operating and power is unavailable from the grid. A black start generator used to start main central station generators is considered to be an auxiliary generator.

Backup (Standby) Generator: A generator that is used only for test purposes, or in the event of an emergency, such as a shortage of power needed to meet customer load requirements.

Barrel (bbl.): A unit of volume equal to 42 U.S. gallons.

Bituminous coal: A dense coal, usually black, sometimes dark brown, often with well-defined bands of bright and dull material, used primarily as fuel in steam-electric power generation, with substantial quantities also used for heat and power applications in manufacturing and to make coke. Bituminous coal is the most abundant coal in active U.S. mining regions. Its moisture content usually is less than 20%. The heat content of bituminous coal ranges from 21 to 30 million BTU per ton on a moist, mineral-matter-free basis. The heat content of bituminous coal consumed in the United States averages 24 million BTU per ton, on the as-received basis (i.e. containing both inherent moisture and mineral matter).

British Thermal Unit: The British thermal unit (BTU or Btu) is a traditional unit of energy equal to about 1.06 kilojoules. It is approximately the amount of energy needed to heat 1 pound (0.454 kg) of water1 °F (0.556 °C). It is used in the power, steam generation, heating and air conditioning industries. In North America, the term "BTU" is used to describe the heat value (energy content) of fuels, and also to describe the power of heating and cooling systems. When used as a unit of power, BTU per hour (BTU/h) is the correct unit, though this is often abbreviated to just "BTU".

Capital Cost: The cost of field development, plant construction, and the equipment required for industry operations.

Climate Change: A term used to refer to all forms of climatic inconsistency, but especially to significant change from one prevailing climatic condition to another. In some cases, "climate

[11] U.S. Energy Information Administration glossary posted at www.eia.doe.gov/ plus multiple sources for additional Alaska specific terms.

change" has been used synonymously with the term "global warming"; scientists, however, tend to use the term in a wider sense inclusive of natural changes in climate, including climatic cooling.

Coal: A readily combustible black or brownish-black rock whose composition, including inherent moisture, consists of more than 50% by weight and more than 70% by volume of carbonaceous material. It is formed from plant remains that have been compacted, hardened, chemically altered, and metamorphosed by heat and pressure over geologic time. It is estimated that Alaska holds about 15% of the world's coal resources, amounting to 170 billion identified short tons. Major coal provinces include Northern Alaska, the Nenana area, Cook Inlet – Matanuska Valley, the Alaska Peninsula, and in the Gulf of Alaska and the Bering River. Alaska coals exhibit low metallic trace elements, good ash-fusion characteristics, and low nitrogen content making them favorable for meeting environmental constraints on combustion in power plants.

Cogeneration system: A system using a common energy source to produce both electricity and thermal energy for other uses, resulting in increased fuel efficiency.

Combined Cycle: An electric generating technology in which electricity is produced from otherwise lost waste heat exiting from one or more gas (combustion) turbines. The exiting heat is routed to a conventional boiler or to a heat recovery steam generator for utilization by a steam turbine in the production of electricity. This process increases the efficiency of the electric generating unit.

Combustion: Chemical oxidation accompanied by the generation of light and heat.

Commercial Sector: An energy-consuming sector that consists of service-providing facilities and equipment of businesses; Federal, State, and local governments; and other private and public organizations, such as religious, social, or fraternal groups. The commercial sector includes institutional living quarters. It also includes sewage treatment facilities. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a wide variety of other equipment. Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the activities of the above-mentioned commercial establishments.

Consumer (energy): Any individually metered dwelling, building, establishment, or location.

Diesel #1: Also known as DF1 or Jet A. Diesel #1 is commonly used as heating fuel throughout most of northern rural AK. Diesel #1 has a lower gel temperature than Diesel #2 which is sold for heating fuel in warmer climates. Diesel #1 is same fuel the refineries sell as Jet fuel (Jet A), and in many tank farms it is stored as Jet A until sold as DF1.

Diesel #2: Is commonly used throughout the US. In Alaska it is used for marine and highway diesel as well as heating fuel in warmer regions. Diesel #2 is preferred over #1 where it is warm enough as it has higher energy content.

Diesel Fuel: A fuel composed of distillates obtained in petroleum refining operation or blends of such distillates with residual oil used in motor vehicles. The boiling point and specific gravity are higher for diesel fuels than for gasoline.

Distillate Fuel Oil: A generic name for a refined petroleum product. It can refer to diesel, heating fuel or jet fuel.

Electricity: A form of energy characterized by the presence and motion of elementary charged particles generated by friction, induction, or chemical change.

Energy Balance: The difference between the total incoming and total outgoing energy. When the energy budget is balanced, the system neither gains nor loses energy.

Energy Information Agency (EIA): An independent agency within the U.S. Department of Energy that develops surveys, collects energy data, and analyzes and models energy issues. http://www.eia.doe.gov/

Exports: Shipments of goods from within the 50 States and the District of Columbia to U.S. possessions and territories or to foreign countries.

Fuel: Any material substance that can be consumed to supply heat, power, or mechanical energy. Included are petroleum, coal, and natural gas (the fossil fuels), and other consumable materials, such as uranium, biomass, and hydrogen.

Furnished without payment (power): The amount of electricity furnished by the electric utility without charge, such as a municipality under a franchise agreement or for public street and highway lighting. It does not included energy consumed by the utility.

Gallon: A volumetric measure equal to four quarts (231 cubic inches) used to measure fuel oil.

Gas: A non-solid, non-liquid combustible energy source that includes natural gas, coke-oven gas, blast-furnace gas, and refinery gas.

Grid: The layout of an electrical distribution system.

Gross Domestic Disposition: The total amount of energy available for sale in the domestic region, i.e. energy produced for sale in the domestic region in addition to energy imported for sale within the domestic region.

Gross Extraction: The total amount of fuel obtained or produced by a power production plant.

Gross Generation: The total amount of electric energy produced by generating units and measured at the generating terminal in kilowatt-hours (kWh) or megawatt hours (MWh).

Heating Degree Days (HDD): A measure of how cold a location is over a period of time relative to a base temperature, most commonly specified as 65 degrees Fahrenheit. The measure is computed for each day by subtracting the average of the day's high and low temperatures from the base temperature (65 degrees), with negative values set equal to zero. Each day's heating degree days are summed to create a heating degree day measure for a specified reference period. Heating degree days are used in energy analysis as an indicator of space heating energy requirements or use.

Hydroelectric Power: The use of flowing water to produce electrical energy.

Imports: Receipts of goods into the 50 States and the District of Columbia from U.S. possessions and territories or from foreign countries.

Industrial Sector: An energy-consuming sector that consists of all facilities and equipment used for producing, processing, or assembling goods. The industrial sector encompasses the following types of activity: manufacturing, agriculture, timber harvest and wood processing, fishing and fish processing, hunting, mining, oil and gas extraction, and construction. Overall energy use in this sector is largely for process heat and cooling and powering machinery, with lesser amounts used for facility heating, air conditioning, and lighting. Fossil fuels are also used as raw material inputs to manufactured products. Note: This sector includes generators that produce electricity and/or useful thermal output primarily to support the above-mentioned industrial activities.

Injections: Natural gas injected into storage reservoirs.

Installed Capacity: The maximum theoretical production output of a plant, based either on nameplate capacity or actual (practically determined) capacity.

Internal Combustion: The process where fuel is burned, or combusted, inside a cylinder, such as a diesel engine, producing power directly as opposed to fuel burning externally, such as in a steam engine. The term internal combustion engine usually refers to an engine in which combustion is intermittent, such as the more familiar four-stroke and two-stroke piston engines. A second class of internal combustion engines uses continuous combustion: gas turbines, jet engines and most rocket engines.

Kilowatt-hour (kWh): A unit of energy equal to one kW applied for one hour; running a one kW hair dryer for one hour would dissipate one kWh of electrical energy as heat. Also, one kWh is equivalent to one thousand watt hours.

Kilowatt (kW): One thousand watts of electricity (See Watt).

Load (Electric): Amount of electricity required to meet customer demand at any given time.

MCF: One thousand cubic feet.

Megawatt (MW): One million watts of electricity (See Watt).

Mining: An energy-consuming subsector of the industrial sector that consists of all facilities and equipment used to extract energy and mineral resources.

Nameplate Capacity: The maximum rated output of an electric power production unit (i.e. generator, prime mover) under specific conditions designated by the manufacturer. Capacity is usually indicated on a nameplate physically attached to the generator.

Natural Gas: Gas in place at the time that a reservoir was converted to use as an underground storage reservoir in contrast to injected gas volumes.

Net Capacity: The maximum load that an electrical apparatus (i.e. generating unit or station) can carry, not including use by the electrical apparatus.

Net Domestic Disposition: The total amount of energy produced in the domestic region that is available for sale within the domestic region, i.e. not including energy use by producers or energy exported for sale outside of the domestic region.

Net Extraction: The total amount of fuel obtained or produced by a power production plant, not including electric energy use by the plants.

Net Generation: The amount of gross generation not including the electrical energy consumed at the generating station(s) for station service or auxiliaries. Note: Electricity required for pumping at pumped-storage plants is regarded as electricity for station service and is deducted from gross generation.

Oil: A mixture of hydrocarbons usually existing in the liquid state in natural underground pools or reservoirs. Gas is often found in association with oil (See Petroleum).

O&M: Operations and maintenance

Other: The "other" category is defined as representing electricity consumers not elsewhere classified. This category includes public street and highway lighting service, public authority service to public authorities, railroad and railway service, and interdepartmental services.

Peak: The amount of electricity required to meet customer demand at its highest. The summer peak period begins June 1st and ends September 30th, and the winter peak period begins December 1st and ends March 31st.

Petroleum: A broadly defined class of liquid hydrocarbon mixtures. Included are crude oil, lease condensate, unfinished oils, refined products obtained from the processing of crude oil,

and natural gas plant liquids. Note: Volumes of finished petroleum products include non-hydrocarbon compounds, such as additives and detergents, after they have been blended into the products.

Petroleum Products: Petroleum products are obtained from the processing of crude oil (including lease condensate), natural gas, and other hydrocarbon compounds. Petroleum products include unfinished oils, liquefied petroleum gases, pentanes plus, aviation gasoline, motor gasoline, naphtha-type jet fuel, kerosene-type jet fuel, kerosene, distillate fuel oil, residual fuel oil, petrochemical feedstocks, special naphthas, lubricants, waxes, petroleum coke, asphalt, road oil, still gas, and miscellaneous products

Plant: A term commonly used either as a synonym for an industrial establishment or a generating facility or to refer to a particular process within an establishment.

Power: The rate of producing, transferring, or using energy that is capable of doing work, most commonly associated with electricity. Power is measured in watts and often expressed in kilowatts (kW) or megawatts (MW).

Power Cost Equalization Program (PCE): Participating utilities receive state funding to reduce the charge to consumers in rural areas where prices can be three to five times higher than prices in urban areas.

Prime Mover: The engine, turbine, water wheel, or similar machine that drives an electric generator; or, for reporting purposes, a device that converts energy to electricity directly (e.g. photovoltaic solar and fuel cells).

Prime Mover Code	Prime Mover Description (U.S. EIA)
ST……..	Steam Turbine, including nuclear, geothermal and solar steam (does not include combined cycle)
GT……..	Combustion (Gas) Turbine (includes jet engine design)
IC……..	Internal Combustion Engine (diesel, piston)
CA……..	Combined Cycle Steam Part
CT……..	Combined Cycle Combustion Turbine Part
CS……..	Combined Cycle Single Shaft (combustion turbine and steam turbine share a single generator)
CC……..	Combined Cycle - Total Unit
HY……..	Hydraulic Turbine (includes turbines associated with delivery of water by pipeline)
PS……..	Hydraulic Turbine – Reversible (pumped storage)
BT……..	Turbines used in a binary cycle such as geothermal
PV……..	Photovoltaic
WT……..	Wind Turbine
CE……..	Compressed Air Energy Storage

FC…….. Fuel Cell
OT…….. Other
NA…….. Unknown at this time (use only for plants/generators in planning stage)

Pro Forma: A Latin term means "for the sake of form," it describes a method of calculating financial results in order to emphasize either current or projected figures.

Purchased Capacity: The amount of energy and capacity available for purchase from outside the system.

Railbelt: The portion of Alaska that is near the Alaska Railroad, generally including Fairbanks, Anchorage, the communities between these two cities, and the Kenai Peninsula.

Refinery: An installation that manufactures finished petroleum products from crude oil, unfinished oils, natural gas liquids, other hydrocarbons, and oxygenates.

Reinjected: The forcing of gas under pressure into an oil reservoir in an attempt to increase recovery.

Renewable Energy Fund (REF): Established by the Alaska State Legislature and administered by the Alaska Energy Authority to competitively award grants to qualified applicants for renewable energy projects.

Renewable Energy Resources: Energy resources that are naturally replenishing but flow-limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Renewable energy resources include biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.

Residential Sector: An energy-consuming sector that consists of living quarters for private households. Common uses of energy associated with this sector include space heating, water heating, air conditioning, lighting, refrigeration, cooking, and running a variety of other appliances. The residential sector excludes institutional living quarters.

Residual Fuel Oil: A general classification for the heavier oils that remain after the distillate fuel oils and lighter hydrocarbons are distilled away in refinery operations. It is used in steam-powered vessels in government service and inshore power plants, and can be issued for the production of electric power, space heating, vessel bunkering, and various industrial purposes.

Revenue (Electricity): The total amount of money received by an entity from sales of its products and/or services; gains from the sales or exchanges of assets, interest, and dividends earned on investments; and other increases in the owner's equity, except those arising from capital adjustments.

Short Ton: A unit of weight equal to 2,000 pounds.

Space Heating: The use of energy to generate heat for warmth in housing units using space-heating equipment. It does not include the use of energy to operate appliances (such as lights, televisions, and refrigerators) that give off heat as a byproduct.

Steam: Water in vapor form; used as the working fluid in steam turbines and some heating systems.

Transmission System (Electric): An interconnected group of electric transmission lines and associated equipment for moving or transferring electric energy in bulk between points of supply and points at which it is transformed for delivery over the distribution system lines to consumers, or is delivered to other electric systems.

Tonne (Ton): A unit of mass equal to 1,000 kilograms or 2,204.6 pounds, also known as a metric ton.

Total Disposition: The total amount of sold or transferred energy.

Turbine: A machine for generating rotary mechanical power from the energy of a moving force (such as water, hot gas, wind, or steam). Turbines convert the kinetic energy to mechanical energy through the principles of impulse and reaction, or a mixture of the two.

U.S. Department of Energy (DOE): Oversees programs, such as Wind Powering America, with the mission to advance national, economic, and energy security; promote innovation; and ensure environmental responsibility. http://www.energy.gov/

Watt (Electric): The electrical unit of power. The rate of energy transfer equivalent to one ampere of electric current flowing under a pressure of one volt at unity power factor.

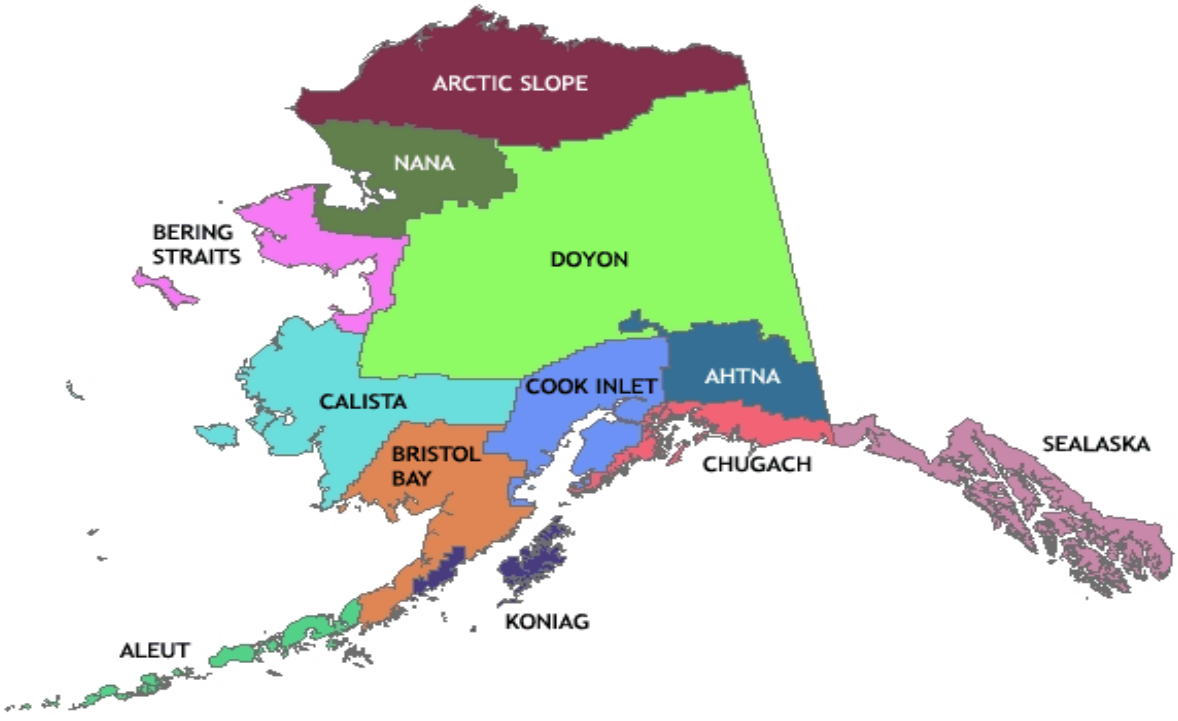
Watt (Thermal): A unit of power in the metric system, expressed in terms of energy per second, equal to the work done at a rate of one joule per second.

Watt hour (Wh): The electrical energy unit of measure equal to one watt of power supplied to, or taken from, an electric circuit steadily for one hour.

Appendix B. Maps of Energy Regions

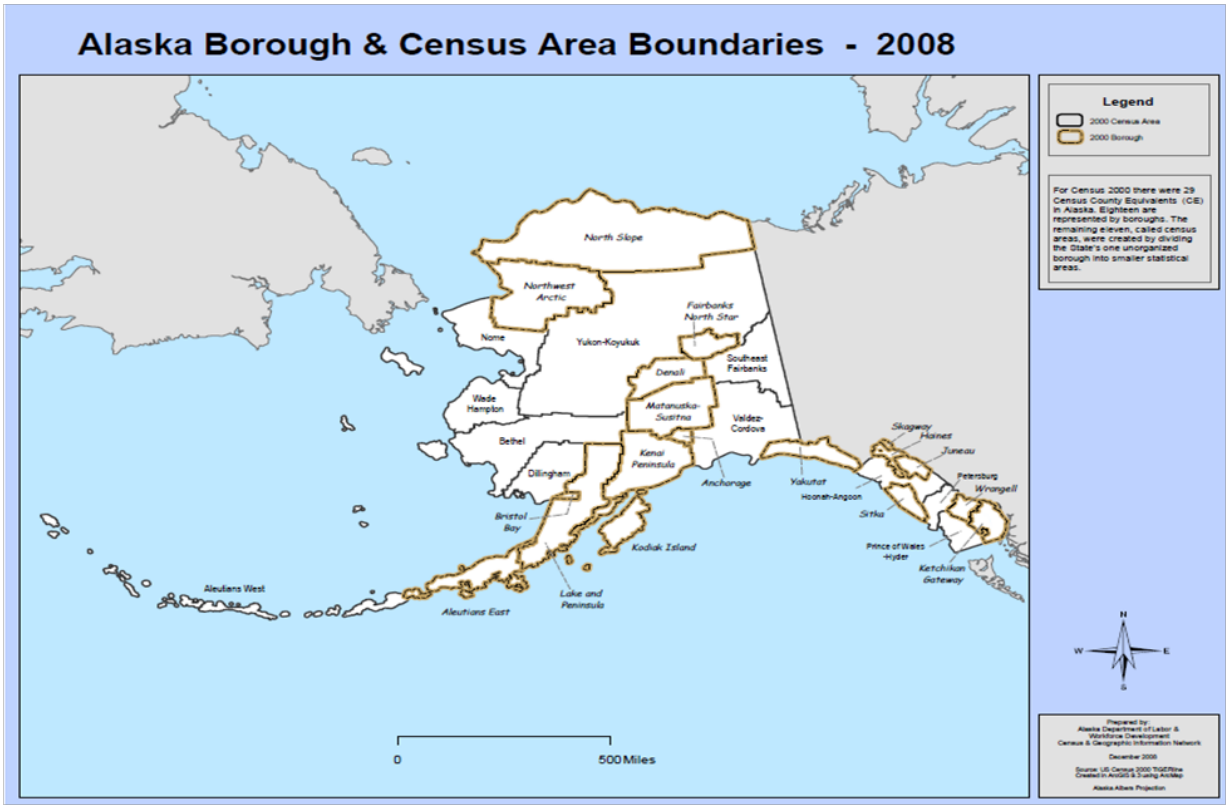
Figure1. Alaska Energy Statistics 2003 Regions

Figure 2. Native Corporation Regions



Source: First Alaskans Institute

Figure 3. Alaska Census Area Map



Source: 2000 Census, Alaska Department of Labor and Workforce Development

Figure 4. Alaska Energy Regions Map

Source: Alaska Energy Authority

Appendix C. Data Sources for Electric Energy Statistics

The primary data source for the electric power statistics are the U.S. Department of Energy (DOE), Energy Information Administration (EIA) and the Alaska Energy Authority, Power Cost Equalization program data. Every utility and industrial (including military) electrical generating facility with a capacity greater than one megawatt is required to report their operating characteristics to the EIA annually, and in some instances, monthly. This information is compiled by the EIA and is available for every generating facility on their website: (http://www.eia.doe.gov/). The forms of interest to compile this publication are the EIA 860, 861 and 923. These are reporting forms for capacity, generation, sales and revenues.

The use of the EIA database is a continuation of the methodology used in the 2008 and 2009 *Alaska Electric Power Statistics* update, however with some modifications in order to publish this report more timely. Most utilities and industrial facilities are required by law to report to the federal government each year on their activities using the EIA forms; this information is then made available on the EIA website. This process causes a delay; the lag time for the availability of the federal data is approximately two years. However, it is redundant to collect the same information through a second questionnaire. Respondents are required by law to report to the EIA and this should make the response rate high. In order to expedite this process, the Alaska Energy Authority collected copies of the CY2010 EIA forms from a selective group of utilities, and created a reduced data set.

Nonetheless, using EIA data poses some challenges because not all information reported in this publication is collected via the EIA forms. First, the smallest utilities with installed capacity less than one megawatt are not required to report to EIA and are not included in the EIA database. Second, not all Alaska generating facilities report as required by law.

These forms collect data at different levels of aggregation; for example some at the utility level only, while other data may be at the facility and/or generator level. This sometime causes differences in the underlying definition of the data making reconciliation of the information in the datasets within forms, and across the different forms sometimes difficult.

To supplement missing data we used the database for the annual Power Cost Equalization Reports by the Alaska Energy Authority (AEA). Also, as needed, the Alaska Energy Authority and ISER supplemented these data sources by contacting utilities directly.
These data sources allowed us to collect information for almost all the utilities in the state without incurring the considerable cost of conducting a complete census of all producers. A few of the smallest utilities that were not either in the EIA database or the Power Cost Equalization database did not provide information for this report.

The 2010 Power Cost Equalization data provided data on the generation and sales (residential and commercial) of all utilities participating in the Power Cost Equalization program, including a breakdown by community for those utilities that operate in multiple communities, such as Alaska Village Electric Cooperative (AVEC) and Alaska Power and Telephone (AP&T). The EIA

data for these utilities was in some cases reported only as a total across all communities, and we used this as control totals. AEA, AVEC, AP&T and NSPL provided helpful assistance in supplying installed capacity information for each plant not originally included in the PCE database. In this case we were able to publish information taken directly from the utility reflecting statistics from each of its serviced communities.

The PCE database contains information collected through AEA's PCE Utility Monthly Report which PCE participants must file. Utilities also report to the RCA annually for fuel cost adjustments. Reporting to both entities should be consistent, however discrepancies are not unusual. These discrepancies may be due to high turnover in small utilities, poor reporting and limited staff to verify the utilities' self-reported data.

In addition, there are data (energy loss, use by facility and energy provided without charges) that is not included in the PCE report. Because of this, the values found in table 2.2a may not reflect a summation of all AP&T communities as reported in the PCE report. Rather they reflect what was reported to the EIA directly as prepared by the utility itself. This same methodology was implemented in the sales and revenues tables (2.4a) when deemed appropriate. The intent is to create as comprehensive of a table as possible.

The summary information in the historical tables was calculated from the same sources mentioned above. Data from these sources was calculated and re-formatted where appropriate and consolidated into master data files from which all the tables in this report where built. Inevitably the use of multiple data sources introduces some inconsistencies in reporting. Notwithstanding, we believe that the *Alaska Electric Power Statistics* 2010 update report provides useful information on the state of electric power generation in Alaska.

Appendix D. Reporting Requirements

Energy Information Administration

Every utility facility with a capacity greater than one megawatt (MW) is required to report their operating characteristics to the US Department of Energy (DOE), Energy Information Administration (EIA) annually, and in some instances, monthly. This information is compiled by the EIA and is available for every generating facility on their website (http://www.eia.doe.gov/). Specific reporting requirements are determined by the Department of Energy but collected, assembled, and evaluated by the EIA according to the Federal Energy Administration Act of 1974. We obtained data for year 2010. Three EIA forms were used in this report:

- **EIA-860 Annual Electric Generator Report**. This report contains information on capacity and types of fuel used. It is completed by all existing plants and proposed (5-year plans) plants that: 1) have a total generator nameplate capacity (sum for all generators at a single site) of one MW or greater; and 2) where the plant is connected to the local or regional electric power grid and has the ability to draw power from the grid or deliver power to the grid.

- **EIA -860M Monthly Update to the Annual Electric Generator Report**. This report contains monthly updates to the EIA-860. It is completed by those who also completed EIA-860 and additionally indicated a proposed change in generator production within one month of the report period. The proposed change may be due to: 1) a new generator scheduled to start commercial operation; 2) an existing generator scheduled to retire from service; or 3) an existing generator with a proposed modification scheduled.

- **EIA-861 Annual Electric Power Industry Report**. This report contains information on peak production, net generation, sales, and revenues. It is completed by electric industry distributors including: electric utilities, wholesale power marketers (registered with the Federal Energy Regulatory Commission), energy service providers (registered with the Regulatory Commission of Alaska), and electric power producers.

- **EIA-923 Power Plant Operations Report**. This report contains information on electric power generation, fuel consumption, fossil fuel stocks, and fossil fuel cost and quality. It is completed by all electric power plants that: 1) have a total generator nameplate capacity (sum for generators at a single site) of one MW or greater; and 2) where the plant is connected to the local or regional electric power grid and has the ability to draw power from the grid or deliver power to the grid.

Power Cost Equalization Program and Regulatory Commission of Alaska

Participants of the Power Cost Equalization (PCE) program report to the Regulatory Commission of Alaska (RCA) for fuel cost adjustments to their rates. The RCA has authority to maintain accounts and records of public utilities that fall under its jurisdiction, under Alaska Statute 42.05.451. This responsibility allows the Regulatory Commission of Alaska to obtain information from regulated utilities. Additionally, all utilities that serve ten or more customers must obtain an operating certificate, which describes the authorized service area and scope of operations of the utility. The RCA will issue a certificate when it finds the utility to be fit, willing, and able to provide the service. The RCA maintains a list of both regulated and unregulated certified utilities. Utilities report annually to the RCA, but file a PCE Utility Monthly Report with AEA.